

REPRODUCTIVE OBSERVATIONS OF A THORNY DEVIL, *MOLOCH HORRIDUS*, IN A NATURAL SEMI-ARID ENVIRONMENT

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ABSTRACT

A female Thorny Devil (*Moloch horridus*) was observed digging a nest burrow approximately 50 km north of Kalgoorlie in December 2001. Seven neonates hatched, with one being found and measured nearby. The burrow dimensions were: 890 mm long, 110 mm wide and 80 mm high, with the nest burrow about 300 mm below the surface. The temperature in the burrow was 24.7 °C (1400 hrs) and 24.4 °C (overnight minimum) a couple of days after the neonates hatched. The hatchling was SVL 38 mm, tail 28 mm, and 2.4 g. These data are compared with other published information on egg laying and oviposit sites in Western Australia.

INTRODUCTION

Little field ecology and few reproductive data have been reported on the Thorny Devil, *Moloch horridus*. Withers (1993), Withers and Dickman (1995), and Withers and Bradshaw (1995) have studied water and energy balances, cutaneous water acquisition and the role of its diet in determining the water, energy and salt balance. Pianka and Pianka (1970) and Pianka *et al.* (1998) have studied the ecology and reproduction, and reproductive information has been reported by Pianka *et al.* (1996), Sporn (1955; 1958; 1965) and White (1947).

I had the opportunity whilst in the field to observe the digging of a nest burrow and on a return trip measure a hatchling *M. horridus* and the dimensions of the empty nest burrow.

RESULTS

A gravid *M. horridus* was observed digging a nest burrow on 12 December 2001 about 10 km west of Broad Arrow (30° 27' S; 121° 20' E) in the northern Goldfields of Western Australia. The burrow opening was approximately 110 mm wide and 80 mm high in a flattened horizontal 'D' shape. The burrow was located in very hard,

red laterite clay substrate, with a shallow sandy surface containing a scattering of surface granite and quartz rocks. The nesting burrow opening was dug away from any vegetation and loose surface rocks.

Digging was achieved by several scrapes of one foot, either the front or back, and then the other foot on the same side. The process was then repeated on the other side. After digging for approximately 4–5 scrapes by each foot, she would rest for 20–30 seconds before commencing to dig again. The female *M. horridus* was caught, measured (Table 1) and released back into the opening of the nesting burrow immediately so she could continue digging. Eggs were clearly visible in the abdomen of the female dragon; however, the number could not be counted. At the time of capture the nest burrow was only about 150 mm deep so the Thorny Devil was easily visible. Within a minute of being released back into the burrow, the female Thorny Devil left the burrow and walked quickly to shelter under a nearby spinifex tussock (*Triodia* sp.). This female *Moloch* had been caught twice before on 9 and 11 January 2001.

On 13 and 14 December, the nest burrow was deeper and the *M. horridus* was no longer visible at the bottom of the burrow, so we were unsure if the female was present in the hole. The opening to the nest burrow was marked with rocks and sticks on 15 December so that it could be located on a subsequent visit.

The nesting burrow was checked again on 8 January 2002 when it

was found that the burrow had been closed, so that the opening was flush with the surrounding substrate. There were no external markings present that would have drawn predator interest to the patch of soil where the opening of the burrow had been. The burrow was observed daily for the following 16 days but there was no change.

On 7 April 2002 the nesting burrow was again revisited. There was a small hole about 30 mm by 30 mm at the point where the original burrow opening was dug. This was the escape hole for the hatchlings. The nest burrow was excavated to measure its dimensions. The contrasting soft disturbed soil and hard undisturbed adjacent soil enabled the burrow to be excavated. The length of the burrow was 890 mm and the end was approximately 300 mm below the surface. The burrow was predominately straight with only a shallow left bend half way down its length, to avoid a rock. There was no enlarged nest chamber at the end of the burrow and the width of the tunnel stayed constant for its entire length (approximately 100 mm). The burrow was only back filled for the first 100–150 mm. The egg cases were laying on the soil at the base of the burrow.

Seven empty eggshells were found in the bottom of the burrow. A thermometer was placed in what used to be the bottom of the burrow, the burrow refilled and left overnight. The burrow temperature was 24.7 °C at 1400 hrs (ambient temperature 35.9 °C) and had dropped to a minimum

Table 1. Size and mass of female and hatchling *Moloch horridus*

Date	SVL and tail length (mm)	Mass (g)
9/1/01	96, 75	56.1
11/1/01	96, 75	54.1
12/12/01 (digging)	100, 75	71.0
10/4/02 (hatchling)	38, 28	2.4

of 24.4 °C overnight compared to the ambient minimum of 12.7 °C (Table 2). On 10 April 2002, a hatchling (umbilical scar was still clearly visible and unhealed) *M. horridus* was pit-trapped less than 100 m away. It was measured and released at point of capture (Table 1).

DISCUSSION

The digging technique used by the female *M. horridus* north of Kalgoorlie was similar to that reported by Sporn (1955). Digging techniques were not described by Pianka *et al.* (1996) or White (1947). White (1947) did, however, mention that the *M. horridus* "scraped the sand back with its fore-feet like a cat" when sealing up the surface of the burrow. I did not observe backfilling and sealing of the nest burrow.

Pianka and Pianka (1970) reports clutch sizes of 3 to 10 with a mode of 8. Sporn (1955; 1965) reports clutches of 5 to 9 eggs (5 clutches). This observation of 7 eggs is within the ranges reported. The mean length of the seven dried eggs is 20.3 mm. Hudson (1977) reported the eggs shells to be at least 18 mm in length. Pianka *et al.* (1996) reported the relative clutch

mass of three *M. horridus* from the Great Victoria Desert as 34.2, 41.7 and 40.9%.

Egg incubation time for reptiles varies according to ambient temperature (Thompson and Pianka 2001). Sporn (1965) reported incubation periods for captured *M. horridus* hatched in Mandurah, WA, ranging from 90 to 132 days, with a mean of 115 days. Hudson (1977) reported that eggs took between 104 and 110 days to hatch and Pianka *et al.* (1996) reports incubation periods of 123–124 and 127 days for *M. horridus* that hatched in the Great Victoria Desert. The length of time between digging of the nest burrow and finding the hatchling *Moloch* was 113 days, which is comparable with those reported elsewhere, although I cannot be certain that the hatchling was from the nest burrow described.

These eggs were laid much later than those reported by Pianka *et al.* (1996) in the Great Victoria Desert – 19 September, 3 October and 12 November. It is possible that the *M. horridus* that I observed would have laid on 15 or 16 December. This is about one month later than those observed in the desert. Pianka *et al.* (1996) does, however, comment that the dates of egg laying in the Great Victoria Desert were earlier than his earlier reports (Pianka and Pianka 1970) thus lengthening the estimate of the duration of the egg-laying season for desert specimens. In captivity, Sporn (1965) recorded egg laying between October 16 and December 9. Sporn (1965) reported double clutching by *M. horridus* on 25 October and

29 December, and Philipp (1979) on 7 November and 11 January. Both of these observations were made in captivity. Philipp (1979) also reports that *M. horridus* was able to store sperm, as there was no male present to re-fertilise his female between the first and second egg laying. Observations in captivity may not represent what occurs in nature as the food availability and climate are varied.

I found no evidence of an enlarged chamber at the base of the burrow that was reported by others. White (1947) for example, reports a nesting chamber 178 mm in diameter and 101 mm high and Pianka *et al.* (1996; 1998) reports nesting chambers in three different burrows; two of which were measured (120 mm wide, 90 mm high and 150 mm long; and 120 mm wide, 80 mm high and 120 mm long). Sporn (1955; 1958; 1965) also reports nesting chambers for the *M. horridus* that he observed to lay eggs whilst held in captivity.

The temperatures observed in the nesting burrow north of Kalgoorlie (Table 2) are lower than those observed by Pianka *et al.* (1996). Pianka *et al.* (1996) reports temperatures of 31 and 30.8 °C in the burrow chamber, whereas, I

found maximum burrow temperature to be 24.7 °C with a minimum of 24.4 °C overnight compared to the ambient overnight minimum of 12.7 °C. These data indicate the nesting burrow was able to sustain a fairly constant temperature even though the ambient temperature was variable (12.7 – 41.4 °C).

The burrow I report was considerably longer (890 mm) than those previously reported elsewhere, although the depth below the surface, internal height and width of the burrow north of Kalgoorlie, are similar to those reported by White (1947; length 430 mm), Sporn (1955; length 560 mm) and Pianka *et al.* (1996). It is unknown why the length was considerably longer in my observation, particularly as the highly compacted laterite is likely to be at least as difficult to dig in as the sandy substrates at Coorow, Mandurah and the Great Victoria Desert. The burrow was only backfilled for the first 150–200 mm; this is the same as Pianka *et al.* (1996) and Sporn (1955) reported. Pianka *et al.* (1996) reported that hatchling *M. horridus* had dug themselves a new escape hole about 300 mm from the original burrow opening. The seven hatchlings from the nesting burrow I observed had dug themselves out the original burrow entrance. Neither Sporn (1955; 1958; 1965) nor White (1947) reported where the hatchling escape hole was located.

Pianka *et al.* (1996) and Sporn (1958) reported no eggshells present in the burrow chambers for the nest burrows that were excavated in

Table 2. Temperature of nesting burrow

Location	Temperature (°C)
Overnight burrow minimum	24.4
Ambient overnight minimum	12.7
Base of burrow at 1400 hr	24.7
Ambient air at 1400 hr	35.9
Ambient maximum	41.4

the Great Victoria Desert and for a single nest burrow in Mandurah. Pianka *et al.* (1996) concluded that the hatchlings might have consumed their own eggshells thus providing extra nutrients (calcium, etc) for early growth. Eggshells were present in the burrow that I excavated. Given the size of the eggshells (mean length 20.3 mm, 0.1g) its possible that the hatchling could eat its own eggshell which is approximately 5% of its body mass however, it seems improbable given that the diet of *M. horridus* is strictly ants (Pianka 1986).

In summary, *M. horridus* is an egg laying dragon lizard, that digs a nest burrow and lay eggs in late Spring and early Summer, but is reported as double clutching in captivity, and lays between 3 and 10 eggs per clutch that take between 90 and 132 days to hatch. Nest burrows are dug at an oblique angle in open areas and sealed so visual detection of the nest site is difficult. The hatchlings, which are perfect replicates of adults, dig their own escape hole and are independent from birth.

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